DEFENSE EXPENDITURES AND SAVINGS IN PAKISTAN: DO ALLOCATIONS TO THE MILITARY REDUCE NATIONAL SAVINGS?

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1. Introduction

A prevalent theme in the literature on the economic impacts associated with defense expenditures stresses the detrimental effects on capital formation. Deger[1] has suggested that capital formation in the developing countries may be constrained not only or necessarily by a shortfall in savings due to high military spending but (perhaps more importantly) by a reduction in absorptive capacity to utilize the available savings as a result of the hypothesized unfavorable impact of military spending on public funding for human resources.[2] While Deger presents some empirical evidence based on a large sample of developing to support this view, the limitations inherent cross section analysis prevent us from drawing any broad generalizations as to the nature of the defense/savings relationship. In fact one could logically argue that military expenditure might force governments to increase taxation and domestic saving, part of which can be used for capital formation; it might foster human capital by training and modernizing people; it may create effective demand and reduce excess capacity.

Ultimately whether or not defense expenditures reduce or increase (or are neutral) domestic savings can only be resolved through empirical testing. The purpose of this paper is to assess the links between defense expenditures and savings in Pakistan. In this regard, Pakistan serves as an ideal case study because of the availability of extensive data on the country's savings rates. Have defense expenditures reduced that country's already low savings rates? Is the impact of defense expenditures on savings different than that of other types of government expenditures and if so what manner?

2. Patterns of Defense Expenditures and Savings

Pakistan's savings efforts are low by developing country standards. In fact, saving as a fraction of the Gross National Product (GNP) is one of the lowest among the developing countries. The current saving rate of about 14 percent of GNP fares badly with 23 percent for other low income developing countries.[3]

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1. See Saadet Deger, *Military Expenditures in Third World Countries: The Economic Effects* (London: Routledge & Kegan Paul, 1986).
2. Steve Chan, "Defense, Welfare, and Growth: Introduction" in Steve Chan and Alex Mintz, *Defense, Welfare and Growth: Perspectives and Evidence* (London: Routledge, 1992), pp. 4-5.
3. Several good comparative studies exist. See for example: Maxwell J. Fry, "Saving, Financial Intermediation and Economic Growth in Asia" *Asian Development Review*, vol 2, no. 1 (1984), pp. 82-91; Maxwell Fry "Domestic

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A brief examination of the patterns of savings and public expenditures in Pakistan (Table 1) does not suggest that (at least since 1973) defense expenditures have played a major role in lowering the country's domestic resources:

i. Defense expenditures appear to have stabilized at around 7 percent of gross domestic product, whereas non-military expenditures increased from 9.6 percent of GDP in 1973 to 17.8 percent in 1989.

Table 1

Pakistan: Patterns of Savings and Government Expenditures, 1973-1991

(percentage of Gross Domestic Product)

Year		Savings				Expenditures	
	Private	Public	Gross Domestic	Gross National	Military	Non-Military
1973	11.26	-0.46	13.47	10.79	7.02	9.62
1974	7.27	-0.15	9.63	7.12	6.83	9.89
1975	6.56	-0.14	7.37	5.99	6.75	10.81
1976	9.45	0.81	10.79	10.26	6.22	10.95
1977	8.90	2.45	-22.63	11.36	6.04	10.36
1978	12.67	1.80	8.81	14.48	5.82	11.64
1979	11.17	1.07	7.12	12.24	6.20	12.39
1980	11.49	2.20	7.79	13.69	6.23	11.31
1981	10.97	4.16	9.26	15.12	6.37	12.82
1982	10.95	3.32	8.32	14.27	6.98	10.09
1983	15.73	1.27	8.46	17.00	7.39	11.98
1984	13.03	2.02	7.70	15.06	7.31	12.37
1985	12.55	0.38	6.28	12.93	7.43	12.39
1986	13.18	1.71	10.95	14.89	7.55	13.49
1987	16.48	0.49	13.86	16.98	7.68	13.95
1988	12.30	1.33	12.45	13.63	7.20	16.22
1989	13.87	0.21	12.63	14.08	7.08	17.80
1990	12.32	1.77	13.23	14.09	7.14	16.08
1991	12.01	1.99	14.55	13.99	6.65	15.68

Source: World Bank

Resource Mobilization in Developing Aria: Four Policy Issues *Asian Development Review*, vol. 9, no 1 (1991), pp. 15-39; and Graham J. Abbott, "National Saving and financial Development in Asian Developing Countries" *Asian Development Review*, vol 2 no. 2 (1984), pp. 1-22.

ii. At the same time the country's gross national saving rate has shown considerable fluctuations with public savings particularly low.

iii. Private savings has also fluctuated over a fairly wide range, from a low of 6.56 percent in 1975 to 16.48 percent in 1987.

These patterns suggest that defense expenditures are probably not the major cause of the country's low savings rate. However within the overall context of the domestic economy, defense expenditures may well compound the country's problems at resource mobilization. There are two major explanations for the country's low savings efforts[4]: (a) the financial repressionist[5] and (b) the financial structuralist. The former school led by McKinnon[6] argue that the low (or negative real interest rates caused by arbitrarily set ceilings on nominal interest rates and high and variable inflation rates are the major impediments to savings, financial depending, capital formation and growth. The solution therefore lied in freeing the interest rates to find their equilibrium levels in a free market environment.
The financial structuralist school is led by Godsmith[7] attributes the low savings, investment and growth in developing countries to the relatively less developed financial structures in terms of financial assets, institutions, and markets. He notes that a widespread network of financial institutions and diversified array of financial instruments will have a beneficial effect on the saving-investment process and hance,-on growth.
With respect to Pakistan only Abe[8] and Qureshi[9] have tested empirically the McKinnon-Shaw model and found that financial repression holds domestic saving below the level which would occur under a policy of financial liberalization.[10] In his study Khan found that:[11]

4. Ashfaque H. Khan "Financial Repression, Financial Development and Structure of Savings in Pakistan" *The Pakistan Development Review*, vol XXVII, no. 4 Part II (Winter 1988), pp. 701-711.
5. Financial repression has been generally identified with low nominal interest rates and high and variable rates of inflation, or alternatively with the existence of negative real rates of interest.
6. Ronald McKinnon, *Money and Capital in Economic Development* (Washington, DC: The Brookings Institution, 1973); and Ronald McKinnon, *Money and Finance in Economic Growth* (New York; Marcel Dekker, Inc., 1976).
7. R.W. Goldsmith, *Financial Structure and Development* (New Haven: Yale University Press, 1969).
8. S. Abe, M.J. Fry, B. K. Min, P. Vongipanond and T. Yu "Financial Liberalization and Domestic Saving in Economic Development: An Empirical Test for Six Countries" *Pakistan Development Review*, vol XVI, no. 3 (1977).
9. Zia M. Qureshi, "Household Saving in Pakistan: Some Findings from Time Series Data" *Pakistan Development Review*, vol XX, No. 4 (1981).
10. Khan, op. cit., p. 702.
11. Khan, op. cit., p. 709.

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1. A significant and positive association exists between the real rate of return on deposit and aggregate savings. The interest elasticity of national savings ranges from 0.01 to 0.03 depending upon the choice of sample size.

2. The aggregate real income (measured or permanent) is also found to be a key determinant of national, financial and physical savings. The marginal propensity to save (MPS) out of real income under various expectation schemes for the three types of saving functions range from 0.06 to 0.21.

3. Financial development measured by the financial intermediation ratio is also found to have significant positive influence on the national and financial savings while negative influence of physical savings. Thus the viewpoints of two school schools of thought, namely "financial repressionist" and Financial structuralist" are fully supported in the case of Pakistan.

4. Beside real income (measured or permanent) and real return on deposits there are other factors such as unanticipated inflation and variability of inflation which are found to have a significant impact on these saving funcitons.

In short Khan's findings clearly point out the existence of financial repression on the one hand and lack of financial development on the other hand in Pakistan. The solution, therefore, lies in freeing the return on deposits to find their equilibrium levels in a free-market environment. In particular the authorities should strive to make the real return on deposits positive either by increasing the nominal return or by reducing inflation. Furthermore, a widespread network of financial institutions and a diversified array of financial instruments will increase savings in Pakistan.[12]

3. Defense Expenditures and Resource Availability

Given these environmental conditions, at the aggregate level there are three channels through which military spending can affect growth. The resource allocation effect transfers potential investment resources to the military, reducing investment and growth.[13] The

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12. Khan, op. cit., p. 709.
13. Saadet Deger and Somnath Sen, "Military Expenditure, Aid and Economic Development" *Proceedings of the World Bank Annual Conference on Development Economics, 1991* (supplement to the *World Bank Economic Review and the World Bank Research Observer* (1992), p.. 161-162.

resource allocation effect transfers potential investment resources to the military, reducing investment and growth. The resource mobilization effect shows that defense spending could reduce the national savings ration. The household savings ratio falls because expenditure rises as public services are cut back to finance military expansion, the government saving ratio may decline if the additional defense spending is not compensated by higher tax revenues, and foreign savings are dissipated through arms imports. Finally in countries with human capital constraints an expansion of military personnel and industrial systems will worsen absorptive capacity.

Since the modern defense establishment is a heavy consumer of technical and managerial manpower and foreign exchange, resources that are especially scare in the Third World the conventional wisdom[14] is that increased defense burdens should reduce the overall rate of growth[15].

The issue of defense expenditures and savings/investment was initially examined by Smith[16]. In this study Smith assumed that resources devoted to military purposes can be extracted from economic growth or by diverting resources from consumption and/or investment. Which tradeoffs are pursued is a function of the nature of the state in question. Advanced capitalist states, Smith argues are not likely to interfere with private consumption or the welfare component of public consumption. Such interference would be to unpopular and politically costly. Increases in military spending are thus likely to occur at the expense of investment.

This intuitive notion was first empirically challenged by Emile Benoit[17] in what is often referred to as the Modernization Model. What acknowledging that defense spending necessarily reduces domestic civilian production, and crowds out civilian investment, Benoit contended that these unfavorable effects are apt to be offset by the other more positive effects in developing countries. In particular, Benoit suggested that defense

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14. This survey of the literature draws heavily on Steve Chan "Defense Welfare and Growth: Introduction" in Steve Chan and Alex Mintz eds., *Defense, Welfare and Growth: Perspectives and Evidence* (London: Routledge, 1992), pp. 1-20.

15. For an overview of this argument see Saadet Deger and Robert West, "Introduction: Defense Expenditures, National Security and Economic Development in the Third World" in Saadet Deger and Robert West eds., *Defense, Security and Development* (London: Francis Pinter, 1987), pp. 1-16.

16. Ron P. Smith, "Military Expenditures and Capitalism" *Cambridge Journal of Economics* (1977), pp. 61-76.

17. See in particular: Emile Benoit, *Defense and Economic Growth in Developing Countries* (Lexington, Mass: D.C. Heath, 1973); and Emile Benoit, "Growth and Defense in Developing Countries" *Economic Development and Cultural Change*, vol. 26 (1978), pp. 271-80.

spending and military service in modern skills and attitudes, help to develop basic economic infrastructure, and produce mild inflation which in turn encourages fuller utilization of the existing production facilities. In a variant of this model, Charles Wolf[18] notes that by creating a more stable environment it was very possible in certain cases or situations for added defense expenditures to stimulate higher rates of investment, technological progress, technology transfer and hence increased overall growth.

In defense of Benoit, Babin[19] and Kick and Sharda[20] have found respectively that military spending and personnel tended to contribute to faster economic growth in the relatively long term-ten or twelve years. Stewart[21] looking at a sample of African and Latin American countries found no evidence to support the association of higer defense burdens with slower economic growth. Instead it appears that a larger defense burden is stimulative and in fact, is more stimulative than a larger non defense burden.

Several other analysts-Dixon and Moon[22] have also presented findings indicating that large armed forces (as distinct from large military budgets) seem to be conducive to the development and formation of human capital.

As might be expected this topic has become quite controversial and if sheer numbers of papers[23] alone mean anything a good case could be made that defense expenditures are likely to be detrimental to the economic halth of Third World countries.

18. Charles Wolf "Economic Success, Stability and Old International Order" *International Security* (1981), pp. 75-92.

19. Nehama Babin, "Military Spending, Economic Growth and the Time Factor" *Armed Forces and Society* vol. 15, (1989), pp. 249-62.

20. Edward Kick and Ban Dev Sharda, "Third World Militarization and Development" *Journal of Developing Societies* vol. 2 (1986), pp. 49-67.

21. Douglas B. Stewart "Economic Growth and the Defense Burden in Africa and Latin America: Simulations from a Dynamic Model" *Economic Development and Cultural Change*, vol. 40, no. 1 (October 1991), pp. 199-200.

22. William Dixon and Bruce E.Moon, "The Military Burden and Basic Human Needs" *Journal of Conflict Resolution*, vol. 30 (1986), pp. 660-84.

23. See for example: Nicole Ball "Defense and Development: A Critique of the Benoit Study" in Helena Tuomi and Raimo Vayrynen eds., *Militarization and Arms Production* (New York: St. Martin's, 1983), pp. 39-56; B. Biswas and Rati Ram, "Military Expenditures and Economic Growth in Less Developed Countries" *Economic Development and Cultural Change*, vol. 34 (1986), pp. 361-72; Saadet Deger, *Military Expenditure in Third World Countries: The Economic Effects* (London: Routledge & Kegan Paul, 1986); Saadet Deger and Ron Smith "Military Expenditure and Growth in Less Developed Countries" *Journal of Conflict Resolution*, vol. 27 (1093), pp. 67-83; Ricardo Faini, Patricia Arnez and Lance Taylor "Defense Spending, Economic Structure and Growth: Evidence Among Countries

As Chan notes[24] one of the more powerful criticisms directed against the original Benoit studies is that they gave too much emphasis to the positive effects of defense spending in mobilizing the available national resources and in instilling modern skills and attitudes in the developing world, and that he did not give enough emphasis to the negative effects of defense spending on savings and investment. This capital formation model stresses private investment as the kay determinant of economic growth. Here there is some evidence[25] that the negative effect of military expenditures on saving (and investment) outweighs the positive modernization and technological effect on the growth rate. While this problem may be more prevalent in the industrialized economies, the existence of such a tradeoff has been also observed in the developing world.[26] Country studies have not provided conclusive evidence of a defense investment tradeoff however. In particular studies of India[27] and the Middle Eastern[28] nations were unable to establish any statistically significant tradeoff between defense spending and civilian investment. For the Saudi Arabia, Egypt, Syria and Israel it appears that in a dynamic context defense expenditures have not been ad odds with acceptable economic performance[29].

and Over Time" *Economic Development and Cultural Change*, vol 32 (1984), pp. 487-98; James H. Lebovic and Ashfaq Ishaq "Military Burden, Security Needs, and Economic Growth in the Middle East" *Journal of Conflict Resolution*, vol. 31 (1987), pp. 106-138; Lisa Grobar and Richard C. Porter "Benoit Revisited: Defense Spending and Economic Growth in LDCs" *Journal of Conflict Resolution*, vol. 33 (1989), pp. 318-45; David Lim "Another Look at Growth and Defense in Less Developed Countries" *Economic Development and Cultural Change*, vol. 31 (1983), pp. 377-84.

24. Steve Chan "Defense Welfare and Growth: Introduction" in Steve Chan and Alex Mintz eds., *Defense, Welfare and Growth: Perspectives and Evidence* (London: Routledge, 1992), pp. 3-4.

25. Saadet Deger and Ron Smith "Military Expenditure and Growth in Less Developed Countries" *Journal of Conflict Resolution*, vol 27 (1083), pp. 335-53; Ron Smith, "Military Expenditure and Capitalism" *Cambridge Journal of Economics*, vol 1 (1977), pp. 61-76; and Ron Smith "Military Expenditure and Investment in OECD Countries" *Journal of Comparative Economics*, vol. 4, pp. 19-32.

26. Adne Cappelen, Nils P. Gleditsch and Olav Bjerkholt "Military Spending and Economic Growth in the OECD Countries" *Journal of Peace Research*, vol. 21 (1984), pp. 361-74; and Saadet Deger *Military Expenditure in Third World Countries: The Economic Effects* (London: Routledge & Kegan Paul, 1986).

27. Michael D. Ward et. al., "Economic Growth, Investment and Military Spending in India, 1950-1988" in Steve Chan and Alex Mintz, *Defense, Welfare and Growth: Perspectives and Evidence* (London: Routledge, 1992), pp. 119-136.

28. Robert E. Looney, "The Economics of Middle Eastern Military Expenditures: Implications for Arms Reduction in the Region" *Bulletin of Peace Proposals*, vol. 22, no. 4 (December 1991), pp. 407-418; and James H. Levovic and Ashfaq Ishaq "Military Burden, Security Deeds and Economic Growth in the Middle East" *Journal of Conflict Resolution*, vol. 31 (1987), pp. 106-38.

29. Robert E. Looney, "The Economics of Middle Eastern Military Expenditures: Implications for Arms Reduction in the Region" *Bulletin of Peace Proposals*, vol 22, no. 4 (December 1991), p. 415.

"In fact defense expenditures appear to have produced a greater stimulus to investment than that offered by other types of government expenditures. Regarding shorter-run budgetary trade-offs, there do not appear to be any strongly negative associations between defense and growth-enhancing expenditures such as economic services or education. Ultimately, however the generally positive impact of defense on investment much account for the counter-intuitive finding that defense and growth are positively linked."

Unfortunately many of these studies are inconclusive because the important question of causation was not resolved. In particular do military expenditures affect savings/investment as is usually assumed or in fact do military expenditures simply reflect changing macroeconomic conditions?. Stressing the issue of causation a recent study by Rasler and Thompson[30] attempt to determine if defense expenditures caused the relative decline of the English economy. Using several causality tests, they find that in the nineteenth century, military spending increased (decreased) when nonmilitary public consumption increased (decreased). Major changes in military spending though impact negatively on non-military public consumption. In late twentieth century Britain, however, non-military public consumption positively occurs before military spending. Evidence for a tradeoff relationship is no longer apparent.

Their analysis suggests that prior to World War I investment influenced consumption opportunities. After world War II the picture becomes more complicated. After 1950 economic growth negatively impacts on military spending and private consumption and positively antecedes nonmilitary public consumption. Similarly, investment negatively antecedes military spending and positively antecedes nonmilitary public consumption. From this they conclude that.[31]

"it may also be fair to say that post-1950 military spending as become increasingly subordinated in comparison to the pre-1913 situation....Rising demands in the context of insufficient resources due in considerable part to a century of relative decline are responsible for the nature of consumption-investment squeezes and other policy problems in post-world War II Britain's political economy."

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30. Karen A. Rasler and William R. Thompson "Political-Economic Tradeoffs and British Relative Decline" in Steve Chan and Alex Mintz, eds., *Defense, Welfare and Growth: Perspectives and Evidence* (London: Routledge, 1992), pp. 36-60.

31. Rasler and Thompson, op. cit., p.55.

While Rasler and Thompson's results are controversial, their study does demonstrate that the only way to resolve the debate over defense and savings/investment is through time series causality analysis. This is the approach adopted below in our examination of the Pakistani situation.

4. Alternative Tests for Causation

Several statistical tests are available for addressing the issue at hand. To date, the original and most widely used has been the Granger[32] Test.

Granger Test

Granger defines causality such that X Granger causes (G-C) Y if Y can be predicted more accurately in the sense of mean square error, with the use of past values of X than without using past X. For example, in assessing the relationship between defense and savings performance, Granger causality can be specified as:

$$(1)\,SAV(t) = c + \sum_{i=1}^{p} a(i)SAV(t\text{-}i) + \sum_{j=1}^{q} b(j)DEFt\text{-}j + u(t)$$

$$(2)\,DEF(t) = c + \sum_{i=1}^{r} d(i)\,DEF(t\text{-}1) + \sum_{j=1}^{s} e(j)SAV(t\text{-}j) + v(t)$$

where SAV is a measure of the country's savings effort and DEF = defense expenditures, p,q; r and s are lag lengths for each variable in the equation; and u and v are serially uncorrelated white noise residuals. By assuming that error terms (u, v) are "nice" the specified model is estimated by the ordinary least squares (OLS) method[33].

Within the framework of unrestricted and restricted models, a joint F-test is commonly used for causal detection. The F-statistic would be calculated by:

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32. C.W.J. Grander, "Investigating Casual Relations by Econometric Models and Cross-Spectral Methods," *Econometrica* (1969), pp. 424-438.

33. If the disturbances of the model were serially correlated, the OLS estimates would be inefficient, although still unbiased, and would distort the causal relations. The existence of serial correlation was checked by using a maximum likelihood correlation for the first-order autocorrelation of the residuals [AR(1)]. The comparison of both OLS and AR(1) results indicated that no significant changes appeared in causal directions. Therefore, we can conclude "roughly" that serial correlation was not serious in this model.

$$(3) \; F = \frac{(RSS(x) - RSS(u)/(df(x) - df(u)}{RSS(u)/df(u)}$$

where RSS(r) and RSS(u) are the residual sum of squares of restricted and unrestricted models, respectively; and df(r) and df(u) are, respectively, the degress of freedom in restricted and unrestricted models.

The Granger test detects causal directions in the following manner. First, unidirectional causality from DEF to SAV if the F-test rejects the null hypothesis than past values of DEF in equation (1) are insignificantly different from zero and if the F-Test cannot reject the null hypothesis that past values of SAV in equation (2) are insignificantly different from zero. That is, DEF causes SAV but SAV does not cause DEF. Unidirectional causality runs from SAV to EXP if the reverse is true. Second, bidirectional causality runs between DEF and SAV if both F-test statistics reject the null hypotheses in equations (1) and (2). Finally, no causality exists between DEF and SAV if both null hypotheses cannot be rejected at the conventional significance level.

In a related study Joerding[34] has tested the relationship between defense and growth hypothesis using Granger causality methods. That is he tested for the assumed exogeneity of defense budgets. Using a pooled sample containing 15 observations from each of 57 countries, Joerding employed a multivariate model which also included investment and government spending and concluded that defense expenditures are not strongly exogenous and that previous studies were flawed.

While Joerding's work provides insight into the nature of the relationship between defense and growth, there are three issues that merit further attention:

1. Joerding lumps all countries into one sample. This suggests that any causal relationship which is found is assumed common to all countries. As was shown by Frederiksen and Looney[35] in a review of Benoit's work, splitting a pooled sample into separate groups (in their case based on the level of relative resource constraints) can lead to quite different results.

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34. W. Joerding, "Economic Growth and Defense Spending; Granger Causality" *Journal of Development Economics* (1986), pp. 35-40.
35. P.C. Frederiksen and Robert E. Looney "Defense Expenditures and Economic Growth in Developing Countries," *Armed Forces and Society* (1983), pp. 633-45.

2. By aggregating the sample, Jourging assumed a common lag structure for all of the countries in the sample (in his study, four years on the defense and growth variables). It seems reasonable to hypothesis if a causal relationship does exist (either defense to growth or growth to defense) we could expect the time lag to differ from country to country.

3. Joerging's method for choosing lag length was ad hoc.

The results of Granger causality tests depend critically on the choice of lag length. If the chosen lag length is less than the true lag length, the omission of relevant lags can cause bias. If the chosen lag is greater than the true lag length, the inclusion of irrelevant lags cause estimates to be inefficient.

While Joerding chose his lag lengths based on preliminary partial autocorrelation methods, there is no **a priori** reason to assume lag lengths equal for all of our sample countries. for example in a study of the Philippines, Frederiksen and LaCivita[36] found no statistical relationship between growth and defense when both variables were entered in the estimating equation with a lag equal to four. When the lag length was changed to two periods, however, it was found that growth caused defense. Since both lag lengths were chosen arbitrarily, one cannot say which is preferred.

5. The Hsaio Procedure

To overcome the difficulties noted above, Hsaio[37] has developed a systematic method for choosing lag lengths for each variable in an equation. Hsiao's method combines Granger Causality and Akaike's final prediction error (FPE) defined as the (asymptotic) mean square prediction error, to determine both the optimum lag for each variable and causal relationships. In a paper examining the problems encountered in choosing lag lengths, Thornton and Batten[38] found Hsiao's method to be superior to both arbitrary lag length selection and several other systematic procedures for determining lag length.

36. P.C. Frederiksen and C.J LaCivita, "Defense Spending and Economic Growth: Time Series Evidence on Causality for the Philippines, 1956-1982," *Journal of Philippine Development* (Second Semester 1987), pop. 354-60.
37. C. Hsiao, "Autoregressive Modeling and Money-Income Causality Detection", *Journal of Monetary Economics* (1981), pp. 8.
38. D.L. Thornton and D.S. Batten, "Lag-length Selection and Tests of Grander Causality Between Money and Income," *Journal of Money, Credit and Banking* (1985), pp. 164-78.

The first step in Hsiao's procedure is to perform a series of autoregressive regressions on the dependent variable. In the first regression, the dependent variable is lagged once. In each succeeding regression, one more lag on the dependent variable is added. That is we estimate M regressions of the form:

$$(4) \quad G(t) = a + \sum_{i=1}^{m} b(t-1)G(t-1) + e(i)$$

where the values of m range from 1 to M. For each regression, we compute the FPE in the following manner

$$(5) \quad FPE(m) = \frac{T+m+1}{T-m-1} ESS(m)/T$$

Where: T is the sample size, and FPE(m) and ESS(m) are the final prediction error and the sum of squared errors, respectively. The optimal lag length, m^*, is the lag length which produces the lowest FPE. Once has been determined, regressions are estimated with the lags on the other variable added sequentially in the same manner used to determine m^*. Thus we estimate four regressions of the form:

$$(6) \quad G(t) = a + \sum_{i=1}^{m^*} b(t-1)G(t-1) + \sum_{i=1}^{n} c(t-1)D(t-1) + e(i)$$

with n ranging from one to four. Computing the final prediction error for each regression as:

$$FPE(m^*,n) = \frac{T+m^*+n+1}{T-m^*-n-1} ESS(m^*,n)/T$$

we choose the optimal lag length for D, n^* as the lag length which produces the lowest FPE. Using the final prediction error to determine lag length is equivalent to using a series of F tests with variable levels of significance[39].

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39. Since the F statistic is redundant in this instance they are not reported here. They are, however, available form the author upon request.

The first term measures the estimation error and the second term measures the modeling error. The FPE criterion has a certain optimality property that "balances the risk due to bias when a lower order is selected and the risk due to increases in the variance when a higher order is selected[40]. As noted by Judge[41] an intuitive reason for using the FPE criterion is that longer lags increase the first term but decrease the RSS of the secon term, and thus the two opposing forces are balanced optimally when their product reaches its minimum. With regard to the defense/savings relationship, four cases are possible: (a) **Defense causes Savings**—occurring when the prediction error for savings is reduced when defense is added to the savings equation. In addition when savings is added to the defense equation, the final prediction error increases; (b) **Savings causes Defense**—occurring when the prediction error of savings increases when defense is added to the regression equation for savings, and is reduced when savings is added to the regression equation for defense; (c) **Feedback**—occurring when the final prediction error decreases when defense is added to the savings equation, and the final prediction error decreases when savings is added to the defense equation; and (d) **No Relationship**—occurs when the final prediction error increases when, defense is added to the savings equation, and also increases when savings is added to the defense equation.

6. Methodology

The data for military expenditures used to carry out the Haiso tests were compiled from the Stockholm International Peace Research Institute,[42] SIPRI Yearbook, World Armaments and Disarmament (New York: Oxford University Press, various issues). Annual data on various measures of savings was obtained from the yearly World Bank assessment of Pakistan[43]. The figures on GDP and the GDP price deflators are from the International Monetary Fund[44].

Before analysis was undertaken, several factors needed to be taken into account. First,

40. C. Hsiao, "Causality Tests in Econometrics," *Journal of Economic Dynamics and Control* (1979), p. 326.
41. G.G. Judge, W. Hill, H. Griffiths, H. Lutkephol, and T.C. Lee, *Introduction to the Theory and Practice of Econometrics* (New York: John Wiley and Sons, 1982).
42. Stockholm International Peace Research Institute, *SIPRI Yearbook, World Armaments and Disarmament* (New York: Oxford University Press, various issues).
43. See for example: World Bank, *Pakistan: Country Economic Memorandum FY93, Progress under the Adjustment Program, Report No. 11590-PAK* (Washington: IBRD, March 23, 1993).
44. International Monetary Fund, *International Financial Statistics Yearbook* (Washington: International Monetary Fund), various issues.

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it is widely known that most economic time series are non-stationary. As indicated by Judge, et.al[45]. "Stationary is an important property as it guarantees that there are no fundamental changes in the structure of the process that would render prediction difficult or impossible." In order to remove all possible non-stationarities, real defense expenditures and real income variables were transformed to rates of growth. When these transformed series were regressed on a constant and time, their coefficients on time were insignificantly different from zero for all countries. Similar regressions of the untransformed levels indicated the presence of a trend.

Second, because military expenditures may simply act as a proxy for government expenditures in general, separate regressions were performed using (when available) figures on total government expenditures and allocations to non-defense categories of the budget. If the results were significantly different using these other forms of public spending, we concluded that the defense/growth relationship was unique and not spurious.

7. Results

The results for the causality analysis of defense expenditures and savings are presented with the final prediction error (FPE), together the optimal lag. As a basis of comparison a similar analysis was undertaken for total government expenditures and the government's allocation to non-defense activities. Several interesting patterns emerged from this analysis.

In terms of savings undertaken by the private sector[46] (Table 2):

1. In general, total expenditures on the part of the government reduces private savings.

2. This impact is strong and occurs over a fairly long time frame-averaging three years for the growth in total government expenditures and four years for the growth in the share of government expenditures in GDP.

3. In contrast defense expenditures impact positively on savings. That is increases in defense expenditure increase savings in subsequent time periods. Again the lag is fairly long (four years) for the growth in defense expenditures. However increases in the defense

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45. G.G. Judge, R.C. Hill, W. Griffiths, H. Lutkepohl and T.C. Lee, *Introduction to the Theory and Practice of Econometrics* (New York: John Wiley and Sons, 1982), p. 671.
46. All of the findings summarized below are in the same form as Table 2. They could not be included because of space limitations. However, they are available from the author upon request.

exert a much weaker impact on savings, with the impact occurring after a year.

4. Non-defense expenditures reflect the patterns associated with total expenditures: allocations to these categories reduce savings with an average lag of three years. The impact is somewhat stronger for the growth in expenditures (as opposed to the growth in the share of non-defense in GDP).

Table 2

Pakistan: Interaction of Government Expenditures and Private Sector National Savings 1973-1991

| | Causation Patterns | | | | Dominant Pattern |
	Saving Saving	Saving Expend	Expend Expend	Expend Saving	
Total Expenditures					
Optimal Lag (years)	2	3	2	1	Expend->
Final Prediction Error	(460.16)	(298.60)	(80.32)	(92.97)	Savings (-s)
Total Expenditures Share of GDP					
Optimal Lag (years)	2	4	1	1	Expend->
Final Prediction Error	(460.16)	(290.58)	(50.90)	(52.60)	Savings (-s)
Defense Expenditures					
Optimal Lag (years)	1	4	1	1	Defense->
Final Prediction Error	(460.16)	(350.01)	(26.79)	(30.94)	Savings (+m)
Defense Burden					
Optimal Lag (years)	2	1	1	1	Defense
Final Prediction Error	(460.16)	(433.27)	(26.30)	(30.49)	Savings (+w)
Non-Defense Expenditures					
Optimal Lag (years)	1	3	1	1	Expend->
Final Prediction Error	(460.16)	(397.30)	(159.87)	(171.64)	Savings (-s)
Non-Defense Share of GDP					
Optimal Lag (years)	1	2	1	1	Expend->
Final Prediction Error	(460.16)	(422.61)	(130.22)	(137.29)	Savings (-m)

Notes: Summary of results obtained from Granger Causality Tests. A Hsaio Procedure was incorporated to determine the optimal lag. All variables are in the from of growth rates. The dominant pattern is that with the lowest final prediction error. The signs (+,-) represent the direction of impact. In the case of feedback the signs refer to the second and fourth set of causation patterns (i.e., Defense/Revenues and Revenues/Defense). Each of the variables was regressed with 1, 2, 3, and 4 year lags. Strength assessment (s = strong; m = moderate; w = weak) based on the size of the standardized regression coefficient and t test of statistical significance. Defense burdens are the share of defense expenditures in GDP. Defense expenditures are from: Stockholm International Peace Research Institute, SIPRI Yearbook (New York: Oxford University Press), various issues. Economic data are from: International Monetary Fund, International Monetary Fund, International Financial Statistics Yearbook (Washington: International Monetary Fund), various issues.

Keeping in mind the very low levels (as a share of GDP) the causation analysis for this category of domestic resources provided several additional findings are of interest:

1. In contrast to the patterns associated with private savings, total expenditures interact with public savings through a feedback relationship: increases in the growth of public expenditures and the growth in their share of GDP both have a moderately strong and positive impact on public savings. In return increased public savings has a weak negative impact on future public expenditures.

2. On the other hand, non defense expenditure so no statistically significant relationships vis a vie public savings. This holds for both the growth in defense expenditure and the growth in the defense burden (defense expenditures as a share of GDP).

3. Finally non-defense expenditures exhibit a strong and positive impact on public savings. This impact occurs on average over a period of two to three years.

These patterns of expenditures and public savings suggest that past public savings do not contribute to increased spending rates. Instead the government funds its expenditures largely out of current revenues and its borrowing program. The non-defense component of these exenditures may in turn stimulate the country's tax base to the extent that (again over a short time period) revenues out-run the government's ability to spend.
Another contrasting pattern is associated with public expenditures and changes in the country's gross domestic savings. While there were no statistically significant links between expenditures and savings over the 1960-91 period, several links developed in the post-1973 period:

1. Total public expenditures and the non-defense component of these expenditures do not interact with gross domestic savings in any statistically significant way.

2. In contrast defense expenditures have a fairly strong impact on domestic savings. This impact occurs over a long period (averaging four years) and is similar for both the growth in defense expenditures and the growth in the defense burden.

3. As with total expenditures, non-defense expenditures did not show any statistically significant linkages with the country's overall rate of gross domestic savings.

The main difference between gross domestic savings and gross national savings in Pakistan is the remittances of foreign workers. Historically these inflows have resulted in a rate of gross national savings somewhat above that of gross domestic savings. Also

since these inflows are largely exogenous (a function of oil revenues), their links with government expenditures should be more tenuous than in the case of gross domestic savings. Given this situation, several patterns stand out:

1. Total expenditures now impact negatively on savings, with increases in both the rate of growth in expenditures and the growth in the share of GDP reducing savings in the next year. This impact is however quite weak.

2. In contrast increased savings tends to dampen increases in defense expenditures and the defense burden. Again this impact is quite weak and occurs a year following the change in expenditures.

3. Finally non defense expenditures show no statistically significant linkage with savings.

While these patterns suggest that total expenditures may crowd out a certain amount of savings, given the volatile nature of worker remittances and the fact that non-defense expenditures do not appear to impact on savings, one is probably safe in concluding that government expenditures are somewhat neutral with regard to gross national savings. Certainly in terms of the current study there is now evidence that defense expenditures have an adverse effect on the country's national savings rate.

Savings are a residual calculated after subtracting consumption from income. As noted earlier, the literature suggests that many governments may find it politically expedient to reduce investment rather than consumption during periods of expanded defense expenditures. Again Smith's work suggests that this phenomenon is more likely to occur in democratically elected governments.

For the period from 1960-91 however there are no clear patterns linking the various facets of government expenditure with private consumption. This changes however in the post 1973 period where defense expenditures actually decrease private consumption. The impact is fairly strong and occurs with a lag of only one year. As with the post 1960 period as a whole however there is no statistically significant link between total government expenditures or non-defense expenditures and the growth in private consumption.

8. Conclusions

The main finding of this paper is that there is little evidence that military expenditures in Pakistan have preempted domestic savings from the private sector or that these expenditures have reduced the country's rate of savings below its already low levels. Interestingly defense expenditures do appear to impact on domestic savings in a manner quite

different from that of non-defense expenditures. In general, non-defense expenditures may, in some instances, be a factor in retarding the mobilization of domestic resources. The fact that defense expenditures may come at the expense of private consumption further supports the conclusion that allocations to the military may not have the disruptive effect on long run growth often associated in other countries with this category of expenditures.

Abstract

Recent academic literature on defense expenditures stresses a number of potential tradeoffs between allocations to the military and key macroeconomic aggregates. However to date no systematic research has been conducted on the links between defense expenditures and savings. Using Pakistan as a case study the analysis below examines whether defense expenditures have reduced that country's already low savings rates. Specifically: Is the impact of defense expenditures on savings different from that of other types of government expenditures and if so in what manner?

The main finding of this paper is that there is little evidence that military expenditures in Pakistan have preempted domestic savings from the private sector or that these expenditures have reduced the country's rate of savings below its already low levels. Interestingly defense expenditures do appear to impact on domestic savings in a manner quite different from that of non-defense expenditures. On the other hand, non-defense expenditures may, in some instances, be a factor in retarding the mobilization of domestic resources.